

Messrs. Baur and Adams in 1891. Although the subject is by no means as yet exhausted, Mr. Robert Ridgway, the able and energetic Curator of the Department of Birds at Washington, has thought it expedient to collate the knowledge thus far secured, and to facilitate future investigations by the preparation of the memoir now before us.

The last complete account of the avifauna of the Galapagos was that given by Mr. Salvin in the *Transactions* of the Zoological Society of London in 1876, in which he showed that fifty-seven species of birds were then known to occur in the Galapagan group, of which thirty-eight were peculiar. Mr. Ridgway's revised list proves that good progress has been made in our knowledge of the birds of these islands during this past twenty years. He shows us that 105 species are now known to be included in the Galapagan avifauna. These he refers to forty-six genera, of which five (*Nesomimus*, *Certhidea*, *Geospiza*, *Camarkynehus* and *Nesopelia*) are peculiar to the group. The first four of these, besides some others, are represented in many of the islands by peculiar species. Mr. Ridgway treats of all the Galapagan species one after another in a most complete manner, stating their specific characters, synonyms and distribution, and adding a list of the specimens contained in the National Museum of the United States. Moreover, the ranges of the different species are clearly shown in a series of outline maps.

As regards the explanation of the fact that the species of the Galapagan fauna are mostly confined to certain islands of the group, Dr. Baur, in his biological lectures delivered in 1894, put forward the view that at a former period the islands were connected with one another and formed a single large island, of which all but the higher points (which now constitute the islands) have been since submerged. Mr. Ridgway does not positively adhere to this view, although he pronounces it to be "at least worthy of serious consideration."

THE LATE PROFESSOR ROY, M.D., F.R.S.

FOR some long time past Prof. Roy, of Cambridge, has been in very serious ill-health. On Monday, the 4th of this month, death somewhat suddenly removed him from among us. He was only forty-three years of age. The news of the loss of so gifted a worker, and so enthusiastic a leader in investigation, will come as a heavy blow to many throughout the civilised world who have at heart the progress of scientific pathology. His adopted University had already had to deplore its loss in his failing health and powers.

Prof. Roy—Charles Smart Roy—was a native of Arbroath. His education was received at first in that town, then in the University of St. Andrews, then in that of Edinburgh. At the last-named he graduated in medicine as a Bachelor in 1875, and was subsequently appointed a resident physician at the Royal Infirmary in the wards of Dr. Balfour, well known as an authority on valvular lesions of the heart. On the completion of the term of that office Roy migrated to London, and opened original research work on the contagious pleuropneumonia of cattle. However, at the outbreak of the Turkish-Servian war he volunteered for service. As a Surgeon-Major in the Turkish army he was given charge of the large garrison hospital at Janina in Epirus. Epirus remained untouched by the active fighting of the campaign, and during his period of service Roy in spare hours designed an instrument for recording changes in the volume of the frog's heart—his frog-cardiometer. At the close of the war he returned to London and finished his investigation into pleuro-pneumonia, conducting it at the Brown Institution, where Prof. Burdon-Sanderson was then superintendent. This work is the only one by him

which deals mainly with morbid anatomy. He proceeded next to Berlin. At that time he had the intention of devoting three years on the continent to improvement of his medical knowledge, with a view to returning ultimately to medical practice. At Berlin he studied pathology in Prof. Virchow's laboratory, but he also commenced in Du Bois' laboratory an investigation into the physiology of the heart, chiefly with use of the cardiometer already alluded to. He was thus one of the earliest workers in Du Bois-Reymond's new and palatial Physiological Institute, where Prof. Kronecker was then chief assistant. The results of his research were embodied in a dissertation for the degree of Doctor of Medicine of Edinburgh: the thesis was awarded a gold medal by the University, and the Doctor's degree was proceeded to in 1878. In the same year his remarkable paper "On the influences which modify the work of the heart" was published in Foster's *Journal of Physiology*, a paper based chiefly on the work done for his thesis.

In the course of the next year Roy was appointed assistant at the Physiological Institute of the Strassburg University, under Prof. Goltz. As assistant there, his time could be given practically entirely to research, and was so with noteworthy results. He devoted himself to "Observations on the form of the pulse-wave as studied in the carotid of the rabbit." The paper showed more clearly than either of his previous the advent of an investigator of originality and power. An instrument was invented for the research—the sphygmotonometer, an ingenious plethysmograph adapted to record the changing volumes of the free but unopened blood-vessel. Specimens of the original tracings obtained by it hang now as models of reference in more than a few laboratories both at home and abroad. It was also about this date that he devised his instruments for measuring and recording graphically the measurements of the extensibility and elasticity of the walls of blood-vessels. These latter are the subject of his second paper in Foster's *Journal*, and the data he obtained are now incorporated as part of text-book knowledge in physiology. The chief instrument he used presents points of similarity to the myograph, the principle of which was suggested to Prof. Blix by the late Fritjof Holmgren; but Roy's instrument preceded the Holmgren-Blix instrument, and was evolved altogether independently of that.

In the same year (1879) appeared his work, done in conjunction with Dr. Graham Brown, on capillary blood-pressure, published in Foster's *Journal*. The research carried out, we believe at odd hours in the dwelling-room of the two friends, furnished more trustworthy measurements than any pre-existing. By an ingenious apparatus these absolute measurements, very important for the physiology of the circulation, were unexceptionably obtained. It was in the same, or in the previous, year that Roy devised the ether-freezing microtome. The instrument came into use largely in Great Britain and on the continent, and his original pattern, little modified, is still employed in many laboratories.

Roy now, always keen to apply his work to practical medicine, moved from the physiological to the pathological laboratory at Strassburg; but he soon left v. Recklinghausen's to attend Cohnheim's institute at Leipzig. There, in personal communication with Cohnheim, his attention was attracted especially to problems concerning vascular changes in the kidney. He devised the instrument by which perhaps his name is best known, the renal oncometer, for the study of the variations of the blood-flow through the kidney. The observations accessible by this instrument have become familiar to every physiologist and pathologist. The research which by its aid its inventor, with Cohnheim, prosecuted on the renal circulation remains a classic in the literature of the

circulation. The acquaintanceship of the two workers rapidly ripened into intimate friendship. Kuhne in his memorial sketch (1885) of Cohnheim wrote: "Once only did his name appear in actual association with that of a pupil, to wit in association with that of the present Professor of General Pathology at Cambridge, Charles Roy, in the 'Researches on the Circulation in the Kidneys.' These exact and laborious researches, through which the younger worker and the elder must go down to posterity together, were the last that Cohnheim ever edited himself, and in their prosecution it was a delight to him to admire the extreme skill and the happy facility of his younger colleague, well suited as those gifts were to prosecute scientific pathology in the very direction in which he himself believed it could prosper best." Cohnheim's death in 1884, at the early age of forty-five, was felt by Roy as a severe personal loss. He often spoke of Cohnheim in terms of enthusiastic admiration. He looked upon himself as in a way representing in this country the leadership which Cohnheim held as a pathologist of a new school in Germany. Roy stayed at Leipzig nearly a year. While there he received the G. H. Lewes studentship for research in physiology. This studentship had just been founded by "George Eliot" in memory of her deceased husband, and Roy was its first recipient.

In tenure of this studentship he worked in Prof. Michael Foster's laboratory at Cambridge, and thence issued his paper "On the Physiology and Pathology of the Spleen" (*Journal of Physiology*, vol. v.). This communication contains his discovery of an autochthonous rhythmic tonicity in the mammalian spleen; the vasomotor reactions of the organ were also elucidated. In 1880 he was elected a member of the Physiological Society. While then at Cambridge he lectured to advanced students of physiology on the elasticity of animal tissues. In 1882, on the election of Prof. Greenfield to the Edinburgh chair of General Pathology, Roy was chosen to succeed him as Professor Superintendent of the Brown Institution. There he plunged into the work on the action of the mammalian heart, which he never relinquished until nervous breakdown divorced him from his laboratory.

Soon after his installation at the Brown Institution, Roy was commissioned to investigate in the Argentine Republic a disease which was devastating the herds in the province of Entre Rios. He succeeded in alleviating the mischief by a preventive inoculation. He used the viscacha as medium for attenuating the intensity of the virus. The year 1884 was especially eventful for him. Early in that year he published his valuable method for measuring the specific gravity of the blood, a method suitable for and used with great success in conducting clinical observations. In May he was elected a Fellow of the Royal Society, and soon after that he was elected to the newly-instituted chair of Pathology in the University of Cambridge. He was elected a member of the Alpine Club almost in the same week. He was then in his thirtieth year. In the following summer, 1885, Asiatic cholera having appeared in a very severe epidemic form in Spain, he spent the middle and autumn of the year in prosecuting investigations into the bacteriology of the epidemic with his friends Dr. Graham Brown and Prof. Sherrington. The report of the observations obtained was presented to the Royal Society in the year following.

Although his activity at Cambridge during the later tenure of his chair has suffered under his failure of health, and in the early period was hampered by want of adequate accommodation in the matter of buildings and equipment, Roy's work for his department in the short time that it had free scope was marked by conspicuous success in many ways. In 1887, with the co-operation of Sir Richard Webster, he succeeded in securing the found-

ation of the J. Lucas Walker Studentships in Pathology. These have been of the greatest benefit, both in furthering discovery and in training investigators in scientific pathology. The selection of the candidates for these studentships lay largely with the Professor of Pathology; in his laboratory the whole or main part of their work was accomplished; in it and in them he always took the keenest interest, following their progress with eagerness. The mere recital of their names (Dr. William Hunter, Prof. Adami, Prof. Kanthack, Dr. Lorrain Smith, Prof. Wesbrook, Dr. Cobbett) suffices to indicate the sterling success Roy achieved in this department of his office. The lectures on pathology were on Roy's appointment at first delivered in the old theatre, for the Regius Professor of Physic, adjoining the Medical Museum; the work of research and teaching at that time was carried on in rooms lent by Prof. Foster from the physiological laboratory. It was there that the research on the "Mechanism of the Circulation in the Brain," undertaken in conjunction with Prof. Sherrington, was carried out (*Journal of Physiology*, vol. x.). But in 1889 buildings vacated by the Chemistry School were transformed and refitted to receive the department of Pathology. In the better laboratory several able pupils joined him—Griffiths, Rolleston, Hankin, Keng, Hardy, and Barlow; Prof. Arthur Gamgee, and Prof. Filehne of Breslau also for some time worked there. A rapid output of excellent work in experimental pathology resulted: researches on endocardic pressures, on the relation between heart-beat and pulse-wave, on the specific gravity of the blood, on the seat of production of hæmoglobin, on mechanisms protective against infection, on the causation of "shock," on the formation of lymph—in all these he actively interested himself, encouraging them absolutely unselfishly. Although his interest in biology was strikingly catholic, problems connected with the circulation had perhaps a paramount attraction for him always; and in 1892 appeared in the *Philosophical Transactions* the long work on the mammalian heart, carried out with Prof. Adami. Instruments were to a large extent specially devised for this research, and some of these have already become means of investigation in other laboratories besides those at Cambridge. The cardiac plethysmograph, and the cardiomyograph, and the automatic counter, were each examples of ingenuity that never failed to meet with resource the mechanical difficulties of a subject numerously beset by them.

Prof. Roy was one of the earliest—perhaps the earliest one—to originate that movement that has resulted in the foundation of the British Institute of Preventive Medicine. To furtherance of the project he devoted much time and work. He advocated its obtaining a site at or near Cambridge: that his advice was not followed on this point, was always to him a matter of deep regret. In 1893 he was President of the Section of Pathology at the annual meeting of the British Medical Association at Newcastle. He took as the subject for his brief but vigorous address the defensive mechanisms exhibited by the animal body under the assault of disease. In 1894 he attended the Section of Physiology at the meeting of the British Association at Oxford, and took an active part in its sessions. The flight of birds, the possibility of flight by man, the construction of flying machines formed a favourite theme with him, and one in which he had made some original observations and experiments; in connection with it he contributed an essay on Flight to Prof. Newton's Dictionary of Ornithology. On coming to reside at Cambridge he became attached to Trinity College. In 1887 he married Violet, daughter of Sir George Paget, the late Regius Professor of Physic in the University. Nearly a year before Prof. Roy's death the condition of his health had led to the appointment of a Deputy-Professor, Prof. A. A. Kanthack.

A man of strong convictions, almost impetuous in his

determination to act upon them, Roy, as a pathologist, had the firm belief that the future science of pathology was most surely and most quickly to be reached along the same lines of advance as physiology has followed with signal success, especially since Ludwig and Bernard. The inferences to be drawn from the mere anatomical study of structural changes induced by morbid processes he considered to be practically exhausted. Indeed, he thought much time had been wasted in pushing such observations into confines of hair-splitting minuteness and detail. It would be, however, wrong to suppose he took little interest in microscopy. On the contrary, new methods of staining tissues, and colouring bacteria, and of following appearances of phagocytosis appealed to him strongly and immediately, and he was early to follow them. It was rather that the laborious unravelling of an individual autopsy by prolonged histological search and anatomical induction seemed to him unfruitful labour, and he gave little time to it. He turned to physical and, especially, to mechanical methods. His ingenuity in devising and his manual skill in the using of mechanical apparatus was, as Kuhne wrote, quite "extraordinary." Indeed, it was to a certain extent harmful to the quality of his work. It limited the scope with which he undertook and the depth to which he pursued a subject. It continually tempted him to wander from investigations toward which he had already accomplished the preliminaries, to open fresh ground in some other direction. A plan usual with him in his own work was to set before himself the obtaining of some particular measurement, *e.g.* the volume of an organ under certain conditions; the more difficult the experiment, the more attraction had it for him; he devised appropriate apparatus, tried it, altered it, made it successful, obtained a certain number of complete experiments, and then moved to another problem often not cognate with that previously taken up. The accuracy and rapidity with which he dissected were surprising, and for dexterity as an operator in the laboratory he had no rival in this country. His scientific papers were all written in a brief, simple and direct style, without repetition of statement, and usually without even any final recapitulation. Protocols of experiments were almost always excluded from them.

As a teacher his career commenced with his advent to Cambridge. His lectures were marked by striking and suggestive thoughts. The matter of them suffered somewhat from the rapid manner of their delivery. He cherished an intention to publish a volume of lectures on the pathology of the circulation; many of his lectures on this subject were brilliantly original. He did not illustrate his lectures by any experiments performed in the lecture hour. In the ordinary students who attended his classes simply for examination purposes he took curiously little interest; whether they passed or failed, attended or did not attend, seemed to go unnoted by him. To those who came to him to pursue research, even of the most unambitious kind, he was a different man. These he treated almost at once as personal friends, and he attached them to him by many ties of kindness and respect. In regard to their work, he was always absolutely sympathetic, equally so in failure and in success. In facing difficulties with them in the experiments they might have in hand, he encouraged with an undaunted cheerfulness of manner, and gave time and thought completely unstintingly in their companionship. He had been heard to confess an ambition to create a school of work in his laboratory somewhat on the lines of that formed in Ludwig's laboratory at Leipzig. Had his original strength been maintained, the results that his life had already produced are earnest, we think, that his ambition would not have been unfulfilled. As it is, his contributions to the study of the mechanisms concerned with the circulation of the blood

can of themselves assure to him a lasting place in the esteem of all biologists.

Prof. Roy was buried at Cambridge on Friday, the 9th inst. The first portion of the burial service was held in the chapel of Trinity College, and was attended by many office-bearers of the University and other members of the Senate. The chief mourners were Mr. James Roy, of Arbroath (brother), Mr. Edmund Paget, Mr. Meyrick Paget, Dr. and Mrs. Hans Gadow, Prof. J. J. Thomson, Prof. Sherrington, Prof. Kanthack, Dr. Lazarus-Barlow, Mr. Cobbett, Mr. Graham Kerr, and Miss Kingsley (niece of the late Charles Kingsley). The clergy officiating in the chapel were the Master of Trinity (Dr. H. Montagu Butler), the Senior Dean (Rev. A. H. F. Boughey), and the Rev. L. Borissow (Precentor). The interment took place at the Mill Road Cemetery, where the Rev. Dr. Thomson, of Oxford, officiated. The proceedings at Trinity were attended by the Vice-Chancellor (Dr. Hill), the Master of Sidney, the Master of Christ's, the President of Queens', Prof. Allbutt, Prof. Macalister, Prof. Bradbury, Prof. Forsyth, Prof. Newton, Prof. Cowell, Prof. Mayor, Prof. Ewing, Prof. Stanton, Dr. Gaskell, Dr. L. Humphry, Dr. Jackson, Dr. Ruhemann, Dr. William Hunter, Dr. Griffith, Dr. Cunningham, Dr. Langley, and Dr. Postgate.

NOTES.

AT the annual general meeting of the London Mathematical Society, which will be held on November 11, the following names will be proposed for election on the Council of the ensuing session :—President, Prof. Elliott, F.R.S.; Vice-Presidents, Major MacMahon, R.A., F.R.S., Dr. Hobson, F.R.S.; Treasurer, Dr. J. Larmor, F.R.S.; Hon. Secretaries, R. Tucker, A. E. H. Love, F.R.S. Other members: Lieut.-Colonel Cunningham, R.E., Dr. Glaisher, F.R.S., Prof. Hill, F.R.S., Prof. Hudson, M. Jenkins, A. B. Kempe, F.R.S., F. S. MacAnlay, D. B. Mair, G. B. Mathews, F.R.S., W. D. Niven, C.B., F.R.S.

SIR PETER LE PAGE RENOUF, the eminent Egyptologist, and for several years keeper of the Egyptian and Assyrian antiquities at the British Museum, died last week, at the age of seventy five.

DR. VICTOR HORSLEY, F.R.S., has been returned at the head of the poll in the recent election for a direct representative on the General Medical Council.

THE Queen has conferred upon Dr. H. Hicks, F.R.S., president of the Geological Society, the Jubilee medal in commemoration of the sixtieth anniversary of her Majesty's reign.

REUTER'S Agency reports that the Imperial Russian Geographical Society is fitting out an expedition to Abyssinia for the purposes of anthropological research. The expedition, which will be under the leadership of M. Dmitrieff, will start during the present autumn.

THE death is announced of Mr. James Heywood, who took an active part in the movement for the abolition of theological tests at universities. Mr. Heywood was elected a Fellow of the Royal Society as long ago as 1839; he was also a Fellow of the Geological Society, and published several works on geological subjects.

WE regret to announce the deaths of Mr. William Scott, Director of the Royal Gardens and Forests, Mauritius; Dr. F. W. Barry, senior medical inspector to the Local Government Board; Dr. Hjalmar Heiberg, professor of pathological anatomy in the University of Christiania; Dr. Hermann